

WHAT IS CLAIMED IS:

1. A communication system, comprising:

5 a first terminal device connected to first and second networks, having only a reception function with respect to the first network and transmission and reception functions with respect to the second network, the first network being a radio network according to IEEE 802.11 and the second network being a radio network slower than the first  
10 network; and

a second terminal device connected to the first and second networks, having at least a transmission function with respect to the first network and transmission and reception functions with respect to the second network;

15 wherein the first terminal device carries out a prescribed procedure required in using the first terminal as a receiving side in the first network, by carrying out communications with the second terminal device through the second network;

20 the second terminal device transmits a prescribed information to the first network on behalf of the first terminal device, the prescribed information being an information required to be transmitted to the first network in order for the first terminal device to receive packets  
25 through the first network; and

the first terminal device receives the packets through the first network.

2. The system of claim 1, wherein the packets are  
30 transmitted from a source terminal to the second terminal device through the first network, and then transmitted from the second terminal device to the first terminal device through the first network using a unidirectional downlink defined between the first terminal device and the second  
35 terminal device in the first network.

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3. The system of claim 1, wherein the packets are directly transmitted from a source terminal to the first terminal device through the first network.

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4. The system of claim 1, wherein the first terminal device notifies a source terminal having transmission and reception functions with respect to the first network to the second terminal device, and the second terminal device  
10 transmits an information necessary for the source terminal to transmit the packets destined to the first terminal device through the first network.

5. The system of claim 1, wherein the first terminal  
15 device notifies a source terminal on a third network different from the first and second networks to the second terminal device, the second terminal device transmits a request for transmitting the packets to the second terminal device to the source terminal through the third network,  
20 the source terminal transmits the packets to the second terminal device through the third network, and the second terminal device transfers the packets received from the source terminal through the third network to the first terminal device through the first network.

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6. The system of claim 1, wherein the first terminal device carries out the prescribed procedure by transmitting a packet containing a control information for the first network and attached with an indication in a MAC layer  
30 indicating that the control information is contained in the packet, to the second terminal device through the second network, and

the second terminal device identifies the packet containing the control information by detecting the  
35 indication by a processing in the MAC layer.

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7. The system of claim 1, wherein the first terminal device carries out the prescribed procedure by transmitting a packet containing a control information for the first network and an indication indicating that the control information is contained in the packet, to the second terminal device through the second network, and the second terminal device identifies the packet containing the control information by detecting the indication by a processing in an upper layer of a MAC layer.

8. A terminal device, comprising:  
a first interface configured to carry out at least a packet transmission with respect to a first network which is a radio network according to IEEE 802.11;  
a second interface configured to carry out packet transmission and reception with respect to a second network which is a radio network slower than the first network; and  
a control unit configured to carry out communications with another terminal through the second interface so as to carry out a prescribed procedure required in using the another terminal as a receiving side in the first network, and transmit a prescribed information to the first network on behalf of the another terminal, the prescribed information being an information required to be transmitted to the first network in order for the another terminal to receive packets through the first network, such that the another terminal can receive the packets through the first network.

9. The terminal device of claim 8, wherein the control unit also receives an interface address of an interface of the another terminal for carrying out a packet reception through the first network, from the another terminal

through the second interface, and transmits the packets through the first interface towards the interface address received from the another terminal.

5 10. The terminal device of claim 8, wherein the control unit also receives an authentication/admission request with respect to the first network from the another terminal through the second interface, and carries out an authentication/admission processing with respect to the  
10 first network through the first interface on behalf of the another terminal, according to the authentication/admission request received from the another terminal.

15 11. The terminal device of claim 8, wherein the control unit also receives a packet transmission request with respect to the first network from the another terminal through the second interface, and transmits the packets through the first interface according to the packet transmission request received from the another terminal.

20 12. The terminal device of claim 11, wherein the control unit also transmits another packet transmission request requesting packet transmission from a source terminal to own terminal through the first network, when the source  
25 terminal indicated in the packet transmission request received from the another terminal is not the own terminal, receives the packets transmitted from the source terminal through the first network according to the another packet transmission request, and transfers the packets to the  
30 another terminal through the first interface.

13. The terminal device of claim 8, wherein the control unit also receives a resource acquisition request with respect to the first network from the another terminal, and  
35 carries out a resource acquisition processing on the first

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network according to the resource acquisition request received from the another terminal.

14. The terminal device of claim 8, wherein the control  
5 unit also judges whether a packet received from the another terminal through the second interface contains a control information for the first network or not, and carries out a processing corresponding to the control information with respect to the first network when the packet received from  
10 the another terminal contains the control information.

15. The terminal device of claim 14, wherein the control unit also stores a correspondence between a first interface address and a second interface address of each terminal  
15 existing on the first network, the first interface address being an address of an interface of each terminal for carrying out a packet reception through the first network and the second interface address being an address of an interface of each terminal for carrying out packet  
20 transmission and reception through the second network, and judges whether the packet received from the another terminal through the second interface contains the control information for the first network or not according to whether an interface address of a source terminal specified  
25 in the packet received from the another terminal coincides with any of first interface addresses stored therein.

16. The terminal device of claim 8, wherein the control unit also transmits an acknowledge packet to be transmitted  
30 to the first network when the another terminal received the packets through the first network, on behalf of the another terminal.

17. The terminal device of claim 16, wherein the control  
35 unit also stores a correspondence between a first interface

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address and a second interface address of each terminal existing on the first network, the first interface address being an address of an interface of each terminal for carrying out a packet reception through the first network and the second interface address being an address of an interface of each terminal for carrying out packet transmission and reception through the second network, and determines whether or not to transmit the acknowledge packet according to correspondences stored therein.

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18. The terminal device of claim 8, wherein the control unit also stores a correspondence between a first interface address and a second interface address of the another terminal, the first interface address being an address of an interface of the another terminal for carrying out a packet reception through the first network and the second interface address being an address of an interface of the another terminal for carrying out packet transmission and reception through the second network.

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19. The terminal device of claim 8, further comprising;  
a third interface configured to carry out packet transmission and reception with respect to a third network different from the first and second networks;

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wherein the control unit also sets up a packet transfer route between the first interface and the third interface within own terminal according to a prescribed control information received from the another terminal through the second interface.

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20. The terminal device of claim 19, wherein the control unit also judges whether other packets received through the third interface should be relayed to the first interface or to the second interface, according to whether the packet transfer route within the own terminal is already set up or

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not.

21. A terminal device, comprising:

5 a first interface configured to carry out at least a packet reception with respect to a first network which is a radio network according to IEEE 802.11;

10 a second interface configured to carry out packet transmission and reception with respect to a second network which is a radio network slower than the first network; and  
15 a control unit configured to carry out communications with another terminal through the second interface so as to carry out a prescribed procedure required in using own terminal as a receiving side in the first network, such that the another terminal transmits a prescribed  
20 information to the first network on behalf of the own terminal, the prescribed information being an information required to be transmitted to the first network in order for the own terminal to receive packets through the first network, and receive the packets through the first network.

22. The terminal device of claim 21, wherein the control unit notifies an interface address of the first interface to the another terminal through the second interface.

25 23. The terminal device of claim 21, wherein the control unit transmits an authentication/admission request with respect to the first network to the another terminal through the second interface, and exchanges information necessary in carrying out an authentication/admission  
30 processing according to the authentication/admission request with the another terminal through the second interface.

24. The terminal device of claim 21, wherein the control  
35 unit also attaches an information indicating that a control

information for the first network is contained or not, to a packet to be transmitted through the second interface.

25. A communication system, comprising:

5 a first terminal device connected to first and second networks, having only a reception function with respect to the first network and transmission and reception functions with respect to the second network, the first network being a radio network according to IEEE 802.11 and the second  
10 network being a radio network slower than the first network;

a second terminal device connected to the first network and a third network different from the first and second networks, having at least a transmission function  
15 with respect to the first network and transmission and reception functions with respect to the third network;

a third terminal device connected to the second and third networks, having transmission and reception functions with respect to the second and third networks; and

20 a fourth device provided on the third network, having transmission and reception functions with respect to the third networks;

wherein the first terminal device carries out a prescribed procedure required in using the first terminal  
25 as a receiving side in the first network, by carrying out communications with the third terminal device through the second network;

the third terminal device carries out the prescribed procedure by carrying out communications with the second  
30 terminal device through the third network;

the third terminal device carries out another prescribed procedure required in relaying packets transferred from the fourth device towards the first terminal device at the second terminal device, by  
35 transferring a control information received from the first

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terminal device through the first network, to the second terminal device through the third network;

the first terminal device transmits a packet transmission request with respect to the fourth device, to  
5 the third terminal device through the second network;

the third terminal device transfers the packet transmission request received from the first terminal device, to the fourth device through the third network;

the fourth device transmits packets in response to the  
10 packet transmission request received from the third terminal device, to the second terminal device through the third network; and

the second terminal device transfers the packets received from the fourth device, to the first terminal  
15 device through the first network.

26. A terminal device for carrying out a data transfer with respect to a first terminal through a first network, under a control of a second terminal, the first terminal  
20 having only a reception function with respect to the first network and transmission and reception functions with respect to a second network, the first network being a radio network according to IEEE 802.11 and the second network being a radio network slower than the first  
25 network, the second terminal being connected to the second network and a third network different from the first and second networks and having transmission and reception functions with respect to the second and third networks, the terminal device comprising:

30 a first interface configured to carry out at least a packet transmission with respect to the first network;

a second interface configured to carry out packet transmission and reception with respect to the third network; and

35 a control unit configured to receive a control

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information transferred from the second terminal through the third network, and transfer packets received from a third device provided on the third network, to the first terminal through the first network according to the control  
5 information.

27. The terminal device of claim 26, wherein the control unit also notifies an interface address of the third interface to the first terminal through the first network.  
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28. The terminal device of claim 27, wherein the control unit notifies the interface address by broadcasting the interface address through the first network.

29. A terminal device for controlling a data transfer with respect to a first terminal through a first network from a second terminal, the first terminal having only a reception function with respect to the first network and transmission and reception functions with respect to a second network,  
15 the first network being a radio network according to IEEE 802.11 and the second network being a radio network slower than the first network, the second terminal being connected to the first network and a third network different from the first and second networks and having at least a  
20 transmission function with respect to the first network and transmission and reception functions with respect to the third network, the terminal device comprising:

a first interface configured to carry out packet transmission and reception with respect to the second  
25 network;  
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a second interface configured to carry out packet transmission and reception with respect to the third network; and

a control unit configured to carry out communications  
35 with the first terminal through the first interface and

communications with the second terminal through the second interface, so as to carry out a prescribed procedure required in using the first terminal as a receiving side in the first network, carry out another prescribed procedure  
5 required in relaying packets transferred from a third device provided on the third network towards the first terminal at the second terminal by transferring a control information received from the first terminal through the first network to the second terminal through the third  
10 network, and transfer the packet transmission request received from the first terminal through the second network to the third device through the third network.

30. The terminal device of claim 29, wherein the control  
15 unit also receive an interface address of an interface of the second terminal for carrying out a packet transmission with respect to the first network, from the first terminal through the second network, checks whether the interface address received from the first terminal exists on the  
20 third network or not, and returns a response indicating a result of checking to the first terminal through the second network.

31. The terminal device of claim 30, wherein the control  
25 unit also transfers a packet with the interface address specified therein received from the first terminal through the second network, towards the interface address through the third network.

30 32. A terminal device for receiving a data transfer through a first network from a first terminal by utilizing a second terminal through a second network, the first network being a radio network according to IEEE 802.11 and the second network being a radio network slower than the  
35 first network, the first terminal being connected to the

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first network and a third network different from the first and second networks and having at least a transmission function with respect to the first network and transmission and reception functions with respect to the third network, and the second terminal being connected to the second network and the third network and having transmission and reception functions with respect to the second and third networks, the terminal device comprising:

a first interface configured to carry out at least a packet reception with respect to a first network which is a radio network according to IEEE 802.11;

a second interface configured to carry out packet transmission and reception with respect to a second network which is a radio network slower than the first network; and

a control unit configured to carry out communications with the second terminal through the second interface so as to carry out a prescribed procedure required in using own terminal as a receiving side in the first network, transmit a packet transmission request with respect to a third device provided on the third network to the second terminal through the second network, and receive packets transmitted from the third device in response to the packet transmission request and relayed by the first terminal through the first network.

33. The terminal device of claim 32, wherein the control device also receives an interface address of an interface of the first terminal for carrying out packet transmission and reception with respect to the third network, from the first terminal through the first network, and notifies the interface address to the second terminal through the second network.

34. The terminal device of claim 33, wherein the control unit also transmits a packet with the interface address

specified therein to the second terminal through the second network.

35. A method of packet transfer in a communication system including a first terminal device connected to first and second networks, having only a reception function with respect to the first network and transmission and reception functions with respect to the second network, the first network being a radio network according to IEEE 802.11 and the second network being a radio network slower than the first network, and a second terminal device connected to the first and second networks, having at least a transmission function with respect to the first network and transmission and reception functions with respect to the second network, the method comprising the steps of:

carrying out a prescribed procedure required in using the first terminal as a receiving side in the first network, by carrying out communications between the first terminal device and the second terminal device through the second network;

transmitting a prescribed information from the second terminal device to the first network on behalf of the first terminal device, the prescribed information being an information required to be transmitted to the first network in order for the first terminal device to receive packets through the first network; and

receiving the packets at the first terminal device through the first network.

36. A method of packet transfer in a communication system including a first terminal device connected to first and second networks, having only a reception function with respect to the first network and transmission and reception functions with respect to the second network, the first network being a radio network according to IEEE 802.11 and

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the second network being a radio network slower than the first network, a second terminal device connected to the first network and a third network different from the first and second networks, having at least a transmission  
5 function with respect to the first network and transmission and reception functions with respect to the third network, a third terminal device connected to the second and third networks, having transmission and reception functions with respect to the second and third networks, and a fourth  
10 device provided on the third network, having transmission and reception functions with respect to the third networks, the method comprising the steps of:

carrying out a prescribed procedure required in using the first terminal as a receiving side in the first  
15 network, by carrying out communications between the first terminal device and the third terminal device through the second network;

carrying out the prescribed procedure by carrying out communications between the third terminal device and the  
20 second terminal device through the third network;

carrying out another prescribed procedure required in relaying packets transferred from the fourth device towards the first terminal device at the second terminal device, by transferring a control information received from the first  
25 terminal device through the first network, from the third terminal device to the second terminal device through the third network;

transmitting a packet transmission request with respect to the fourth device, from the first terminal  
30 device to the third terminal device through the second network;

transferring the packet transmission request received from the first terminal device, from the third terminal device to the fourth device through the third network;

35 transmitting packets in response to the packet

transmission request received from the third terminal device, from the fourth device to the second terminal device through the third network; and

transferring the packets received from the fourth  
5 device, from the second terminal device to the first terminal device through the first network.

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